CLAIM STATUS

1. (Original) A method for determining contact opening dimensions, comprising:

providing a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines;

illuminating at least a portion of the contact openings with a light source;

measuring light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

determining a dimension of the contact openings based on the reflection profile.

2. (Original) The method of claim 1, wherein determining the dimension of the contact openings further comprises:

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric;

selecting a reference reflection profile closest to the generated reflection profile; and

determining the dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

3. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined contact opening dimension.

4. (Original) The method of claim 3, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

5. (Original) The method of claim 1, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined contact opening dimension.

6. (Original) The method of claim 5, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

7. (Original) The method of claim 1, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

8. (Original) The method of claim 1, wherein determining the dimension of the contact openings further comprises:

comparing the generated reflection profile to a target reflection profile; and

determining the dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

9. (Original) The method of claim 1, further comprising identifying a fault condition associated with the contact openings based on the determined contact opening dimension.

10. (Original) The method of claim 1, wherein determining the dimension of the contact openings further comprises determining at least one of a diameter dimension, a depth dimension, and a sidewall angle dimension.

11. (Original) The method of claim 1, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being aligned with the contact openings in an adjacent line.

12. (Original) The method of claim 1, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being offset with respect to the contact openings in an adjacent line.

13. (Original) A method for determining contact opening dimensions, comprising:

providing a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines;

illuminating at least a portion of the contact openings with a light source;

measuring light reflected from the illuminated portion of the contact openings to generate a reflection profile;

comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric;

selecting a reference reflection profile closest to the generated reflection profile; and

determining a dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

14. (Original) The method of claim 13, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined contact opening dimension.

15. (Original) The method of claim 14, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

16. (Original) The method of claim 13, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined contact opening dimension.

17. (Original) The method of claim 16, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

18. (Original) The method of claim 13, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

19. (Original) The method of claim 13, further comprising identifying a fault condition associated with the contact openings based on the determined contact opening dimension.

20. (Original) The method of claim 13, wherein determining the dimension of the contact openings further comprises determining at least one of a diameter dimension, a depth dimension, and a sidewall angle dimension.

21. (Original) The method of claim 13, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being aligned with the contact openings in an adjacent line.

22. (Original) The method of claim 13, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being offset with respect to the contact openings in an adjacent line.

23. (Original) A method for determining contact opening dimensions, comprising:

providing a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines;

illuminating at least a portion of the contact openings with a light source;

measuring light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

comparing the generated reflection profile to a target reflection profile; and

determining a dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

24. (Original) The method of claim 23, further comprising determining at least one parameter of an operating recipe of a etch tool adapted to etch a subsequent wafer based on the determined contact opening dimension.

25. (Original) The method of claim 24, wherein determining at least one parameter of the operating recipe of the etch tool comprises determining at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a

chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

26. (Original) The method of claim 23, further comprising determining at least one parameter of an operating recipe of a photolithography tool adapted to process a subsequent wafer based on the determined contact opening dimension.

27. (Original) The method of claim 26, wherein determining at least one parameter of the operating recipe of the photolithography tool comprises determining at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

28. (Original) The method of claim 23, wherein generating the reflection profile comprises generating the reflection profile based on at least one of intensity and phase of the reflected light.

29. (Original) The method of claim 23, further comprising identifying a fault condition associated with the contact openings based on the determined contact opening dimension.

30. (Original) The method of claim 23, wherein determining the dimension of the contact openings further comprises determining at least one of a diameter dimension, a depth dimension, and a sidewall angle dimension.

31. (Original) The method of claim 23, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being aligned with the contact openings in an adjacent line.

32. (Original) The method of claim 23, wherein providing the wafer further comprises providing the wafer having the test structure comprising the plurality of lines and the plurality of contact openings defined in the lines, the contact openings in one line being offset with respect to the contact openings in an adjacent line.

33. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines, comprising:

a light source adapted to illuminate at least a portion of the contact openings;

a detector adapted to measure light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the contact openings based on the reflection profile.

34. (Original) The metrology tool of claim 33, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric, select a

reference reflection profile closest to the generated reflection profile, and determine the dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

35. (Original) The metrology tool of claim 33, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

36. (Original) The metrology tool of claim 33, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

37. (Original) The metrology tool of claim 33, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

38. (Original) The metrology tool of claim 33, wherein the contact openings in one line are aligned with the contact openings in an adjacent line.

39. (Original) The metrology tool of claim 33, wherein the contact openings in one line are offset with respect to the contact openings in an adjacent line.

40. (Original) A processing line, comprising:

a processing tool adapted to process wafers in accordance with an operating recipe;

a metrology tool adapted to receive a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines, the metrology tool comprising:

a light source adapted to illuminate at least a portion of the contact openings;

a detector adapted to measure light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

a data processing unit adapted to determine a dimension of the contact openings based on the reflection profile; and

a controller adapted to determine at least one parameter of the operating recipe of the processing tool based on the determined contact opening dimension.

41. (Original) The processing line of claim 40, wherein the data processing unit is further adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine the dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

42. (Original) The processing line of claim 40, wherein the detector is further adapted to generate the reflection profile based on at least one of intensity and phase of the reflected light.

43. (Original) The processing line of claim 40, wherein the metrology tool comprises at least one of a scatterometer, an ellipsometer, and a reflectometer.

44. (Original) The processing line of claim 40, wherein the data processing unit is further adapted to compare the generated reflection profile to a target reflection profile and determine the dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

45. (Original) The processing line of claim 40, wherein the processing tool further comprises an etch tool, and the controller is further adapted to determine at least one of an etch time parameter, a plasma chemical composition parameter, an RF power parameter, a gas flow parameter, a chamber temperature parameter, a chamber pressure parameter, and an end-point signal parameter.

46. (Original) The processing line of claim 40, wherein the processing tool further comprises a photolithography tool, and the controller is further adapted to determine at least one of an exposure time parameter, an exposure dose parameter, a depth of focus parameter, a resist spin speed parameter, a soft bake temperature parameter, a post exposure bake temperature parameter, a cool plate temperature parameter, a developer temperature parameter, and a focus tilt parameter.

47. (Original) The processing line of claim 40, wherein the contact openings in one line are aligned with the contact openings in an adjacent line.

48. (Original) The processing line of claim 40, wherein the contact openings in one line are offset with respect to the contact openings in an adjacent line.

49. (Original) The processing line of claim 40, wherein the controller is further adapted to identify a fault condition associated with the contact openings based on the determined contact opening dimension.

50. (Original) A metrology tool adapted to receive a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines, comprising:

a light source adapted to illuminate at least a portion of the contact openings;

a detector adapted to measure light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric, select a reference reflection profile closest to the generated reflection profile, and determine a dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

51. (Original) A metrology tool adapted to receive a wafer having a grating structure comprising a plurality of lines, comprising:

a light source adapted to illuminate at least a portion of the contact openings;

a detector adapted to measure light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

a data processing unit adapted to compare the generated reflection profile to a target reflection profile and determine a dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

52. (Original) A test structure, comprising:

a plurality of lines; and

a plurality of contact openings defined in the lines.

53. (Original) The test structure of claim 52, further comprising a first layer, the lines being defined in the first layer.

54. (Original) The test structure of claim 52, further comprising a first layer and a second layer formed over the first layer, the lines being defined in the second layer.

55. (Original) The test structure of claim 52, wherein the contact openings in one line are aligned with the contact openings in an adjacent line.

56. (Original) The test structure of claim 52, wherein the contact openings in one line are offset with respect to the contact openings in an adjacent line.

57. (Original) The test structure of claim 53, wherein the first layer comprises an insulative layer.

58. (Original) The test structure of claim 57, wherein the insulative layer comprises at least one of silicon dioxide, silicon nitride, silicon oxynitride, and silicon rich oxide.

59. (Original) The test structure of claim 54, wherein the second layer comprises an insulative layer.

60. (Original) The test structure of claim 59, wherein the insulative layer comprises at least one of silicon dioxide, silicon nitride, silicon oxynitride, and silicon rich oxide.

61. (Original) The test structure of claim 54, wherein the first layer comprises a photoresist layer.

62. (Original) The test structure of claim 55, wherein the second layer comprises a photoresist layer.

63. (Currently Amended) A metrology tool, comprising:

means for receiving a wafer having a test structure comprising a plurality of lines and a plurality of contact openings defined in the lines;

means for illuminating at least a portion of the contact openings with a light source;

means for measuring light reflected from the illuminated portion of the contact openings to generate a reflection profile; and

means for determining a dimension of the contact openings based on the determined contact opening dimension.

64. (Original) The metrology tool of claim 63, further comprising:

means for comparing the generated reflection profile to a library of reference reflection profiles, each reference reflection profile having an associated contact opening dimension metric;

means for selecting a reference reflection profile closest to the generated reflection profile; and

means for determining the dimension of the contact openings based on the contact opening dimension metric associated with the selected reference reflection profile.

65. (Original) The metrology tool of claim 63, further comprising:

means for comparing the generated reflection profile to a target reflection profile; and

means for determining the dimension of the contact openings based on the comparison of the generated reflection profile and the target reflection profile.

66. (New) The method of claim 1, wherein providing the wafer having the test structure further comprises providing the wafer having the test structure comprising a plurality of lines each having a width and a plurality of contact openings defined in the lines, each contact opening having a diameter less than the width of the line in which is defined.

67. (New) The method of claim 13, wherein providing the wafer having the test structure further comprises providing the wafer having the test structure comprising a plurality of lines each having a width and a plurality of contact openings defined in the lines, each contact opening having a diameter less than the width of the line in which it is defined.

68. (New) The method of claim 23, wherein providing the wafer having the test structure further comprises providing the wafer having the test structure comprising a plurality of lines each having a width and a plurality of contact openings defined in the lines, each contact opening having a diameter less than the width of the line in which it is defined.

69. (New) The metrology tool of claim 33, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.

70. (New) The processing line of claim 40, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.

71. (New) The metrology tool of claim 50, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.

72. (New) The metrology tool of claim 51, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.

73. (New) The test structure of claim 51, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.

74. (New) The metrology tool of claim 63, wherein each line has a width and each contact opening has a diameter less than the width of the line in which it is defined.